Central Bank Reform, Liberalization and Inflation in Transition Economies

Cukierman, A.; Miller, G.P.; Neyapti, B.

Publication date:
2000

Center
for
Economic Research

No. 2000-106

CENTRAL BANK REFORM, LIBERALIZATION AND INFLATION IN TRANSITION ECONOMIES - AN INTERNATIONAL PERSPECTIVE

By Alex Cukierman, Geoffrey P. Miller and Bilin Neyapti

October 2000

ISSN 0924-7815

Central Bank Reform, Liberalization and Inflation in Transition Economies - An International Perspective

By Alex Cukierman, Geoffrey P. Miller and Bilin Neyapti[1]

July, 7, 2000

Abstract

This paper develops extensive new data on the legal independence of new central banks in 26 former socialist economies (FSE). This data is constructed using the codification system for measuring legal independence developed in Cukierman, Webb and Neyapti (1992) and in chapter 19 of Cukierman (1992). This makes it comparable with earlier data on central bank independence (CBI) in the industrial democracies and in, non FSE, developing countries and permits experimentation with alternative indices of CBI like those reviewed in Eijffinger and van Keulen (1995).

The new indices of independence indicate that central bank (CB) reform in the FSE during the nineties has been quite ambitious. In spite of the large price shocks induced by the transformation from plan to market, reformers in those countries chose to create central banks with levels of legal independence that are substantially higher, on average, than those of developed economies during the eighties.

Based on data from 1989 through 1998 the evidence in the paper suggests that CBI is unrelated to inflation during the early stages of liberalization. But for sufficiently high and sustained levels of liberalization, and controlling for variables like price decontrols and wars, legal CBI and inflation are significantly and negatively related. These findings are consistent with the view that legal CBI, no matter how high, **cannot** contain the powerful inflationary impact of wide scale liberalization of formerly controlled prices. But once the process of liberalization has gathered sufficient momentum legal independence becomes effective in slowing inflation down and the cumulative liberalization index developed by de Melo et. al. (1996) becomes relatively less important.

The paper also presents evidence on factors that affect the level of CBI and examines the relation between inflation and CBI within a broader sample composed of the transition and of the developed economies.

JEL Classification: E5, P2, K1, P16,

Keywords : Central Banks, Legal Independence, Transition Economies, Inflation, Reform.

---

[1] Corresponding author : Cukierman, School of Economics, Tel-Aviv University, Tel-Aviv, 69978, Israel, Tel: 011-972-3-6409-909, Fax: 011-972-3-6409-908. E-mail:<alexcuk@ccsg.tau.ac.il>,

Miller: School of Law, New-York University, E-mail: <millerg@turing.law.nyu.edu>, Neyapti: Department of Economics, Bilkent University, E-mail: <neyapti@bilkent.edu.tr>. Authors names are in alphabetical order.

A previous version of this paper was presented at the June 1998 Fourth Dubrovnik conference on Transition Economies. We gratefully acknowledge the help of Maureen Brown, Robert Christiansen, Patrick Conway, Cevdet Denizer, Alan Gelb, Joel Hillman, Ricardo Lago, Gideon Schurr and Andrzej Slawinski in assembling parts of the data set used. We also benefitted from the criticisms and suggestions of an anonymous referee, Vache Gabrielyan, Robert King, Ricardo Lago and of participants at the Fourth Dubrovnik conference on Transition Economies.

1. Introduction

The, still ongoing, process of transition from plan to market in the former socialist economies (FSE) involves a fundamental process of change in the structure of those economies. In their attempt to create the institutional infrastructure needed for a market economy governments of the FSE scrapped old institutions and replaced them with new ones that were often patterned after similar institutions in the Western democracies.

One element of this process was the creation of a Western type central bank (CB). Practically all FSE either created a totally new CB by breaking the, typically socialist, Monobank into a CB and a private banking system or, in the case of several Central and East European (CEE) countries, substantially upgraded the legal independence of their preexisting central banks. Within a span of eight years (1991 - 1998) **all** FSE created completely new CB laws, or reformed existing laws, at least once and sometimes even twice. Although there are substantial cross country variations among these new CB laws practically all of them embody substantially higher levels of independence than was the case in the pre-reform period.

Prior to, and in some cases after, the enactment of the CB law most transition economies experienced high and variable inflation. In some cases those inflationary episodes even assumed hyperinflationary dimensions.[2] The conjunction of high inflation and of CB reform provides a unique opportunity to examine the relationship between inflation and central bank independence (CBI) in environments with major structural changes and high inflation

This paper has two major purposes. The first is to document and quantify the cross sectional and over time variation in the level of legal central bank independence (CBI) in transition economies in a manner that allows systematic comparisons with the independence of central banks in more mature market economies. The second is to examine whether higher **legal** CBI is associated with lower inflation as is the case in developed economies.[3] This negative association between inflation

---

[2]An informative overall summary of the evolution of inflation in FSE appears in Stern (1996).

[3]Early evidence on inflation and CBI appears in Grilli, Masciandaro and Tabellini (1991), Cukierman (1992), Cukierman, Webb and Neyapti (1992) and Alesina and Summers (1993). Recent surveys of this and later work are Eijffinger and De Haan (1996) and Cukierman (1998).

and legal independence is not obvious apriori for several reasons. First, as is the case in non FSE developing countries, legal independence may be a poor proxy for actual independence because of substantial deviations between actual practice and the law.[4] Second, although CBI may be negatively associated with inflation in relatively stable Western democracies it may not be sufficient to contain the inflationary temptations that arise in the presence of large price shocks such as those that are induced by price decontrols and armed conflicts.

A recent study by de Melo, Denizer and Gelb (1996) reports that inflation is lower in transition economies with a higher level of sustained liberalization. A third purpose of the paper is to examine the relative contributions, if any, of liberalization and of legal CBI to the abatement of inflation.

To this point there has been little systematic work on measuring legal CBI and its relation to inflation in the FSE. Two exceptions are the recent work of Lougani and Sheets (1997) who construct an index of legal independence for twelve FSE and relate it to the rate of inflation in those countries in 1993 and Neyapti (2000) who develops similar data for a sample of eight Central and East European countries between 1989 and 1996.[5] This paper extends both samples along several dimensions. First, it includes 26 FSE and considers the association between inflation and CBI over the entire period between 1989 and 1998.[6] Second, it provides indices for the detailed features of the new laws that are based on the codification system in Cukierman, Webb and Neyapti (1992) and in Chapter 19 of Cukierman (1992). This makes it possible to compare the level of independence of the newly created central banks with that of more established central banks in the world and to

[4]Such deviations led Cukierman, Webb and Neyapti (1992), Cukierman (1992, chapters 19 and 20), Cukierman and Webb (1995), de Haan and Van't Hag (1995) and de Haan and Kooi (1998) to use behavioral proxies of CBI such as the turnover of CB governors and their political vulnerability.

[5]See also Neyapti (1997). Radzyner and Riesinger (1997) contains an informative discussion of legal and of actual independence in 5 CEE. Related work on various small subsets of FSE appears in Hochreiter (1994), Hochreiter and Riesinger (1995) and in Hochreiter, Rovelli and Winckler (1996).

[6]Except for Bosnia-Herzegovina and (contemporary) Yugoslavia this is practically the entire universe of FSE.

experiment with several alternative measures of independence.

The indices of independence developed in this paper reveal that the legal independence of newly created CB in the FSE is higher than that of central banks in developed economies during the eighties. In particular, at least eight of the newly created central banks possess levels of aggregate legal independence which exceed that of the highly independent Bundesbank during the 1980's. The evidence in the paper also shows that inflation and legal independence are negatively related but only above a sufficiently high threshold level of sustained liberalization. Below this threshold inflation is unrelated to legal independence. This confirms, for a wider sample of countries and of periods, the finding of Lougani and Sheets (1997) and of Neyapti (2000) that inflation and CBI are negatively related **subject to** the important qualification above regarding the existence of a threshold degree of cumulative liberalization.

The paper is organized as follows. Section 2 describes the methods used to construct detailed and aggregate indices of legal independence. It also presents the indices and puts them within an international perspective. Controlling for wars and the extent of sustained liberalization section 3 presents preliminary evidence on the relation between inflation and several aggregate indices of legal independence. The sample consists of a pooled cross section time series comprising three broad time periods; The period prior to the enactment of the first CB law, the period after the enactment of the last CB law and, for eight countries, a period between the enactment of a first and a second CB law. The main finding is that legal independence and inflation are unrelated.

Section 4 takes a deeper look at this lack of association by also controlling for the temporary, but powerful, inflationary shocks induced by price decontrols and by allowing for the potential existence of an interaction between legal independence and sustained liberalization. The main finding is that the familiar, from developed economies, negative relation between inflation and legal independence appears also in the transition economies, but only after the process of sustained liberalization crosses a certain threshold. Section 5 examines the relationship between inflation and legal independence in a wider sample that includes the transition countries and the developed economies. Section 6 tests empirically several hypotheses about possible determinants of legal CB independence. This is followed by concluding remarks.

2. The Measurement of Legal CBI in Economies in Transition

There are, by now, several alternative indices of legal CBI. The most comprehensive of those is the index in Cukierman, Webb and Neyapti (1992) or in chapter 19 of Cukierman (1992). This index is based on a coding of sixteen different characteristics of CB charters that pertain to the allocation of authority over monetary policy, procedures for resolution of conflicts between the CB and government, the relative importance of price stability in CB objectives as stated in the law, the seriousness of limitations on lending by the CB to government, and procedures for the appointment and dismissal of the governor of the CB. Cukierman, Webb and Neyapti (1992) present a weighted index of those sixteen characteristics (LVAW) and Cukierman (1992) presents an unweighted version of the same characteristics (LVAU).

Other indices, as those used by Bade and Parkin (1988), Alesina (1988,1989), Grilli, Masciandaro and Tabellini (1991) and Eijffinger and Schaling (1993) can, for the most part, be approximated by subsets of the components of the LVAW (or of the LVAU) index.[7] We therefore code the legal independence of new CB laws in FSE in terms of the sixteen components underlying the LVAW and the LVAU indices. This has two advantages. First, given those sixteen characteristics, it is possible to perform sensitivity analysis with respect to the other indices by using appropriate subsets of those characteristics. Second the LVAW index exists for a wide number of countries during the forty years preceding the breakdown of Communism. The coding of CBI in transition economies in terms of this index allows, therefore, a wide range of international comparisons of legal independence.

The sixteen basic variables underlying the aggregate index LVAW and the references describing the conventions for their coding appear in table A1 of the Appendix.[8] Each variable is

---

[7]A systematic comparison between the different indices appears in Eijffinger and van Keulen (1995).

[8]The index LVAW is obtained via a two rounds judgmental aggregation procedure in the first of which sixteen various features of legal independence are aggregated into eight subgroups. Those eight subgroups are then further aggregated to obtain the index LVAW. The weights used in the second and last round of aggregation are; appointment and dismissal procedures and term of office of the governor -- 0.20; location of authority over monetary policy, CB objectives and severity of limitations on advances to government --0.15 each; limitations on securitized lending,

coded on a scale between 0 and 1 where 0 stands for the minimal level of independence and 1 for the maximal level. Our sample consists of twenty six countries that include all the countries that broke off from the former Soviet Union (FSU), Mongolia, and all the former socialist CEE countries except Bosnia and contemporary Yugoslavia. Table 1 shows (in the last three columns) alternative aggregate indices of legal CBI for those countries. In addition the second and third columns show the year(s) of enactment of the CB law(s) and, when relevant, the year of replacement of the Ruble by a domestic currency respectively. In eight countries there were two CB reforms. In such cases the country holds two rows, each with a different enactment year where the first row stands for the first CB law enacted in that country and the second row for the second CB law.

In some FSU countries like Lithuania and Moldova the Ruble continued to circulate for some time after the enactment of the first CB law so that this law was not effective prior to the replacement of the Ruble by a domestic currency. Hence, in order to evaluate the impact of CB independence on inflation it is important to keep track of both the year of enactment of the law as well as of the year of replacement of the Ruble. This is the motivation for the appearance of the second and third columns.

The table shows the aggregate index LVAW as well as two narrower indices labeled LVES and LVESX respectively. The first index assigns positive weights only to the allocation of authority for monetary policy, the procedures for resolution of conflicts between government and the CB, and the degree of relative focus on price stability as prescribed by the law.[9] LVESX is a weighted average of the narrow LVES index and of the subaggregate of all limitations on lending by the CB to government from Cukierman, Webb and Neyapti (1992) with weights of 0.6 and 0.4 respectively.[10]

---

location of decision about CB lending and other miscalleneous feature of limitations on lending -- 0.10 each; and the width of the circle of potential borrowers from the CB -- 0.05. The indices LVAU and LVAW are highly correlated. Further detail appears in section 19.3 of Cukierman (1992).

[9]The weights used are 0.4, 0.4 and 0.2 respectively. This, relatively narrow index follows the spirit of Eijffinger and Schaling (1993) and of Eijffinger and van Keulen (1995) who claim that those characteristics of legal independence are far more important for inflation than all the rest.

[10]This aggregate "legal limitations on lending" variable is a weighted average of eight different variables that pertain to the tightness of legal limitations on lending by the CB to

It is calculated directly from the individual components in table A1 of the appendix.

Among the CB laws exhibiting the highest levels of independence are those of Estonia, the Czech Republic, Belarus, and the latest laws of Lithuania, Armenia, Moldova and Poland.[11] The last four laws have been enacted between 1995 and 1997. Why did those countries choose such high levels of independence ? This is a question that concerns the sociology and politics of institution formation. Section 6 below offers a tentative discussion as well as preliminary evidence.

Late comers to the circle of CB reformers generally tend to enact laws with higher levels of independence. This feature is particularly striking in countries that had more than one CB reform like Armenia, Moldova, Azerbaijan, Kazakhstan, Lithuania, Poland and Mongolia. In all those cases the level of independence of the second law is higher than that of the first law, and frequently, by a lot. The figures at the bottom of table 1 illustrate the average magnitude of this phenomenon.

It is noteworthy that, in addition, the average level of independence of the first law in countries with two CB reforms is lower than the average level of independence in the entire sample but that their second laws embody a significantly higher level of independence than that of the sample average. Essentially, countries that had two CB reforms initially granted less than average independence to their central banks' but were then led to reconsider their positions. Once the authorities of those countries decided to have a second reform they went farther in terms of legal independence than countries that had only one CB reform.

The general trend in CB legislation illustrated by table 1 is particularly dramatic in view of the fact that during the forty years ending in 1989 there were very few changes in CB legislation.[12] It appears, therefore, that the international monetary policy consensus during recent years has been shifting vigorously towards consideration of CBI as a highly desirable institutional feature. This

---

government. The **relative** magnitudes of the weights are the same as those in table 19.2 (page 380) of Cukierman (1992). The correlation coefficients between LVAW and each of the following :LVES, LVESX are 0.92 and 0.90 respectively. The correlation between LVES and LVESX is 0.96.

[11]The relatively high level of legal independence in Belarus is practically irrelevant for inflation in this country since, during the entire sample period, Belarus continued to use the Russian Ruble.

[12]Chapter 19 of Cukierman (1992) and Cukierman, Webb and Neyapti (1992).

Table 1 : Aggregate Legal Independence in Transition Economies after CB Reform and Year of Removal of the Ruble

Country	enactment year	year of removal of the Ruble [a]	LVAW	LVES	LVESX
Albania	92		0.51	0.47	0.49
Armenia	93	93	0.30	0.60	0.34
Armenia	96	93	0.85	1.00	0.90
Azerbaijan	92	93	0.22	NA	0.42
Azerbaijan	96	93	0.25	NA	0.32
Belarus	92	still in use in 2000	0.73	0.75	0.67
Bulgaria	91		0.55	NA	0.65
Croatia	92		0.44	0.60	0.49
Czech Republic	91		0.73	0.96	0.73
Estonia	93	92	0.78	0.96	0.58
Georgia	95	93	0.73	0.68	0.62
Hungary	91		0.67	0.79	0.61
Kazakhstan	93	93	0.32	0.63	0.56
Kazakhstan	95	93	0.44	0.92	0.79
Kyrgyz Republic	92	93	0.52	0.55	0.55
Latvia	92	92	0.49	0.96	0.73
Lithuania	91	92	0.28	0.37	0.25
Lithuania	96		0.78	0.96	0.58
Macedonia	95		0.41	0.68	0.55
Moldova	91	93	0.38	0.84	0.54

Moldova	95		0.73	0.96	0.94
Mongolia	91		0.43	0.96	0.61
Mongolia	96		0.55	0.92	0.68
Poland	91		0.46	0.49	0.32
Poland[d]	97		0.89	0.92	0.95
Romania	91		0.34	0.51	0.32
Russia	95		0.49	0.47	0.38
Slovak Republic	92		0.62	0.92	0.73
Slovenia	91		0.63	0.72	0.52
Tajikistan	93	95	0.36	NA	0.29
Turkmenistan	92	93	0.26	0.25	0.19
Ukraine[b]	91	93	0.42	NA	NA
Uzbekistan	91[c]	94	0.41	NA	0.71
Uzbekistan	95	94	0.56	0.92	0.92
Average			0.52	0.74	0.57

Countries with two CB reforms - averages:			
First law	0.35	0.65	0.47
Second law	0.63	0.94	0.76

Notes: [a] For obvious reasons this year is shown only for countries that used to be part of the former Soviet Union.

[b] No aggregate index of legal independence is shown for Ukraine in line with our rule not to display such an index when the sum of weights of the legal variables for which there is a meaningful entry is less than 0.7. As can be seen from Appendix table A1 data on **some** of the legal variables in Ukraine is available. Had we calculated an aggregate index from this small set of legal variables we would have obtained an aggregate index showing relatively high independence.

[c] Tentative date.

[d] All the limitation on lending variables underlying the 1997 aggregate index for the Bank of Poland are set to 1.00 because the 1997 Polish constitution prohibits government from borrowing at the CB. Further details and discussion appear in the second footnote to table A1 in the appendix, in Wojtyna (1997) and in Huterski et. al. (1999).

conclusion is reenforced by the international comparison of legal independence presented in the following subsection.

2.1 The legal independence of new central banks in transition economies - an international perspective

This subsection compares the legal independence embedded in the (latest) CB laws in transition economies with that of developed economies during the decade of the eighties. The most striking fact is that, on average, aggregate legal independence of new central banks in transition economies is substantially higher than CBI in developed economies during the eighties. This conclusion is robust to the type of aggregate index used. For example, the average value of LVAW is 0.52 in transition economies and is merely 0.36 in developed economies. Similarly, the average value of LVES is a whopping 0.74 in transition economies against 0.29 in developed economies.[13] Table 2 presents a **common** ranking of both groups of countries for the LVAW and the LVES indices. For the first index the eight countries with the highest scores are all transition economies, followed by high independence countries among developed nations like Germany and Switzerland. For the second index the **first 10** countries with the highest score are all transition economies. The immediately following entries down the ranking are largely taken, again, by the central banks of countries in transition.

It is evident from the table that, sometimes amidst high inflation, political authorities in transition economies made significant efforts to create central banks with high legal independence by international standards. This raises two, possibly related, questions. First, does the difference in legal independence between the two groups of countries reflect a similar difference in **actual** CBI ? Second, why did the political authorities of transition economies rush to delegate so much legal independence to their central banks ? Our feeling with respect to the first question is that the difference in legal independence between the two groups of countries exaggerates the relative **actual** independence of

[13]Since 1989 a number of developed economies (Belgium, France, Italy, Portugal, Spain New-Zealand and the UK) have upgraded legal CBI (Cukierman (1998)). It is likely that even if those changes are taken into consideration average legal independence of central banks in transition economies will remain higher than that of developed economies.

Table 2 : A Comparison of the New Legal Independence in Transition Economies and in Developed Economies During the Eighties

A. Ranked by LVAW [a]

Country	LVAW	Country	LVAW	Country	LVAW
Poland	0.89	Bulgaria	0.55	Iceland	0.34
Armenia	0.85	Kyrgyz Republic	0.52	Romania	0.34
Estonia	0.78	Albania	0.51	Luxemburg	0.33
Lithuania	0.78	Denmark	0.50	Sweden	0.29
Georgia	0.73	Latvia	0.49	Finland	0.28
Moldova	0.73	Russia	0.49	UK	0.27
Belarus	0.73	USA	0.48	Turkmenistan	0.26
Czech Republic	0.73	Canada	0.45	Azerbaijan	0.25
Germany	0.69	Croatia	0.44	Italy	0.25
Hungary	0.67	Ireland	0.44	France	0.24
Switzerland	0.64	Kazakhstan	0.44	New - Zealand	0.24
Slovenia	0.63	Netherlands	0.42	Spain	0.23
Slovak Republic	0.62	Ukraine	0.42	Japan	0.18
Austria	0.61	Macedonia	0.41	Belgium	0.17
Uzbekistan	0.56	Australia	0.36	Norway	0.17
Mongolia	0.55	Tajikistan	0.36		

Table 2 : Continued

B. Ranked by LVES[a]

Country	LVES	Country	LVES	Country	LVES
Armenia	1.00	Macedonia	0.68	Turkmenistan	0.25
Estonia	0.96	Croatia	0.60	Norway	0.21
Latvia	0.96	Kyrgyz Republic	0.55	Finland	0.16
Lithuania	0.96	Denmark	0.52	Ireland	0.16
Moldova	0.96	Romania	0.51	USA	0.16
Czech Republic	0.96	France	0.51	Belgium	0.08
Poland	0.92	Russia	0.47	New -Zealand	0.08
Kazakhstan	0.92	Albania	0.47	Italy	0.04
Mongolia	0.92	Switzerland	0.40	Sweden	0.04
Slovak Republic	0.92	Netherlands	0.37	UK	0.04
Germany	0.87	Australia	0.29	Azerbaijan	NA
Hungary	0.79	Iceland	0.29	Tajikistan	NA
Austria	0.76	Japan	0.27	Ukraine	NA
Belarus	0.75	Canada	0.25	Uzbekistan	NA
Slovenia	0.72	Luxemburg	0.25	Bulgaria	NA
Georgia	0.68	Spain	0.25		

[a] In countries with two CB reforms the latest of the two laws is used.
NA means that there is not enough information to calculate the index. We followed the rule of not reporting an aggregate index whenever information on more than 30 percent of the (weighted) constituent components was missing.

transition economies, particularly during the early stages of transition from planned to market economies. One reason is that the translation of legal independence into actual independence depends on the general regard for the law which is likely to be higher in developed economies with a long democratic and free markets tradition than in the newly created transition democracies. But as the process of sustained liberalization persists and gathers momentum it is likely that this relative bias shrinks. We return to this issue in subsection 4.3 below.

As to the second question an important consideration is the realization on the part of policymakers in the FSE that CBI can substantially enlarge the, initially rather limited, access of their countries to international capital markets. In the world of the nineties CBI is a stamp of economic respectability and for some countries even a prerequisite for access to those markets. It is also likely that the success of the Bundesbank in maintaining price stability and the increasing professional consensus that CBI is conducive to price stability played a role.

3. Legal Independence and Post Enactment Inflation - A First Look

Most existing studies on inflation and CBI in developed and developing countries excluding the transition economies are basically cross sectional. This purely cross sectional focus is dictated by the absence of meaningful temporal variation in existing measures of legal CBI. But in the case of transition economies there were, during the early nineties, dramatic changes in CBI within all the countries concerned. In many cases new central banks were created from scratch and were granted, as we saw in section 2, substantial levels of legal independence.

Did the enactment of new CB laws have a noticeable effect on inflation, and was the decrease in inflation bigger in countries that experienced a larger increase in the legal independence of their CB? Those questions can be answered empirically by utilizing the over time variation, as well as the cross country variation in legal independence. For that purpose we divided the sample, for most countries, into two broad periods. A preenactment period and a post enactment period. For countries that had two CB reforms, the sample was divided into three subperiods. The period prior to (and including the year of) the first enactment, the period after the first enactment up to and including the year of the second one, and the period after the enactment of the last CB law.

In some of the FSU countries like Lithuania, Moldova and Tajikistan the first CB law was

enacted prior to the replacement of the Ruble by a domestic currency.[14] As a result, the new CB law did not become effective until the time of replacement of the Ruble by a domestic currency. In such cases the last year of the first period is taken to be the latest of the year of enactment of the CB law and of the year of replacement of the Ruble by a domestic currency. We thus obtain a pooled cross section - time series sample with, at most, 3 periods for each country.

Aggregate legal independence after the enactment of either the first or the second CB law is taken from table 1. Prior to the first enactment or the replacement of the Ruble by a domestic currency (whichever comes later) it is characterized as zero for all the countries that broke off from the former Soviet Union as well as for Mongolia.[15] Data on preenactment CBI for Hungary, Poland, Romania and countries that broke off from the former Yugoslavia is the same as the legal independence in those countries during the eighties and is constructed from data in Cukierman, Webb and Neyapti (1992) or in chapter 19 of Cukierman (1992). For the remaining CEE countries, for which there is no data, it is taken to be zero.[16] Characterization of preenactment CBI as zero for countries that broke off from the former Soviet Union is natural in view of the fact that there was no separate CB in the Soviet Union. Admittedly, there was a Monobank (the Gosbank) but its function was to finance the transactions that were implied by the central plan rather than to function as a CB in the Western sense.

Inflation is characterized by the rate of depreciation in the real value of money (D) which is

---

[14]An informative discussion of the process of replacement of the Ruble by domestic currencies appears in Melliss and Cornelius (1994) and Conway (1995).

[15]Russia had only one CB reform which took place in 1995 so there is data for this country only for the first and the third periods (see table A4). Accordingly the level of CBI for Russia in its first period (which ends and includes 1995) is taken to be zero. Legal CBI in Russia in effect during the third period is determined by the parameters of the 1995 law. Since Belarus has been using the Russian Ruble throughout our entire sample period its level of legal independence is taken to be the same as that of Russia in spite of the fact that Belarus had a CB reform in 1992. Finally, since it replaced the Ruble by a domestic currency only in 1995 the level of independence in Taijikistan is taken to be the same as that of Russia until and including 1995.

[16]Those countries are Albania, Bulgaria, the Czech Republic and the Slovak Republic. Experimentation with the alternative assumption that in all those countries preenactment legal independence was the same as the **highest** level of legal independence for the CEE countries for which there is preenactment data did not materially affect the nature of the results.

naturally bounded between zero and one. This measure has two advantages over the rate of inflation. First it diminishes the influence of outliers. This is an important consideration in a sample of countries with wide variations in inflation, as is the case here. Second, D is a more meaningful measure of the impact of inflation on individuals than the rate of inflation. This consideration is not important at low rates of inflation since at low rates the divergence between the two measures is negligible. But at high rates, of the kind that have been experienced by a good number of countries in our sample, the divergence becomes significant.[17] D in year t is calculated from data on inflation using the relation D = F / (1 + F) where F is the average rate of inflation between year t-1 and year t. Data on average yearly inflation is obtained from various issues of the EBRD Transition Report and Update (data and detailed references appear in table A2 of the appendix).

The rate of depreciation in the real value of money within each subperiod is taken as a simple yearly average within the subperiod. Since the year of enactment is, by construction, included in the pre-enactment period of the (appropriate) CB law there is a lag between the average value of D in a subperiod and the time at which the CB law in effect in that subperiod became effective.[18]

de Melo, Denizer and Gelb (1996) have recently developed a wide ranging index of liberalization for transition economies. Their work suggests that inflation is negatively related to the cumulative degree of liberalization of the economy (CLI). The cumulative degree of liberalization in a given year is defined as a simple sum of the degrees of liberalization (LI) up to and including the current year. The yearly liberalization index is, in turn, a weighted average (with weights of 0.3, 0.3 and 0.4) of the degrees of liberalization in the following areas : internal markets (**I**), external markets (**E**) and private sector entry (**P**).[19]

---

[17]For example when inflation is one hundred percent the rate of depreciation in the real value of money is only fifty percent.

[18]Our expectation is that, to the extent that a change in legal independence affects inflation, it does so with a lag.

[19] **I** measures the extent of liberalization of domestic prices and abolition of state trading monopolies, **E** measures the degree of liberalization of the foreign trade regime including the extent of currency convertibility and **P** measures the extent of enterprise privatization and of banking reform. As is the case with the aggregate liberalization index each of those indices is bounded between zero and one. The yearly values of CLI appear in appendix table A3.

The rationale for using a cumulative, rather than a yearly , index of liberalization is that at any given time economic performance is affected by the degree of liberalization at that time, **as well as** by the length of time that particular reforms have been in effect. When looking for a potential relationship between inflation and legal CBI it is therefore natural to control for the cumulative degree of liberalization. We measure the degree of cumulative liberalization within a subperiod as the value of CLI at the median year within the subperiod.[20]

Eight out of the twenty six countries in the sample were involved in regional conflicts for at least part of the time span of our sample. Those countries are Croatia, Slovenia, Armenia, Georgia, Moldova, Azerbaijan, Tajikistan and Macedonia. Both theory and evidence suggest that deficits and inflationary finance are higher during wars.[21] To account for possible effects of war on inflation we construct a war dummy (WD) that assumes a value of one in those countries-periods in which the country was at war for more than half of the time during the period (1, 2 or 3) and zero otherwise.[22] The three periods data matrix used in this section is summarized in table A4 of the appendix.

It is likely that, even if it has any impact on inflation, CB reform operates with a lag. Higher independence is likely to affect policy choices with some lag and those choices impact the economy with an additional lag. The construction of periods in our sample builds in a lag by including the year of enactment of a CB reform in the period that precedes this reform. As a consequence the average rate of depreciation in the real value of money in a country during any given subperiod is automatically related to the level of CBI that became effective at least one year in the past. This procedure also reduces the risk of simultaneity bias due to possible reverse causality from inflation to legal CBI.[23]

Table 3 reports various regressions of D on CLI, the war dummy and the three aggregate indices of legal CBI from table 1. The table confirms the de Melo et. al. (1996) result that inflation

---

[20]When the number of years in a subperiod is even CLI for the subperiod is characterized by the mean value of CLI in the two years in the middle of that subperiod.

[21]See for examples Barro (1979), Chapter 15 of Barro (1984) and Roubini and Sachs (1989).

[22]A consequence of this classification is that all the periods for Macedonia are classified as "no war" periods since the 1991 armed conflict in that country was very brief.

[23]Further discussion of this issue appears later.

Table 3 : Inflation, CBI, cumulative liberalization and wars [a]

Dependent variable : D

Regressors :

CLI	-0.05	-0.04	-0.05
	(0.06)	(0.10)	(0.01)
WD	0.17	0.17	0.17
	(0.00)	(0.01)	(0.00)
LVAW	0.00		
	(0.98)		
LVES		-0.07	
		(0.51)	
LVESX			-0.01
			(0.91)
Intercept	0.45	0.44	0.42
	(0.00)	(0.00)	(0.00)
Adj. R- sq	0.33	0.36	0.33
Number of observations	57	51	56

[a]Numbers in parenthesis under the coefficients are levels of significance.

is significantly lower the higher and the more persistent is the degree of liberalization as measured by the variable CLI and reveals a positive and significant influence of war on inflation. But the impact of all three indices of CBI on inflation is insignificant.

Should we conclude from those preliminary results that CB reform in the transition economies did not have any desirable effect on inflation? It is argued in the next section that reaching such a conclusion solely on the basis of this evidence is likely to be premature.

4. Accounting for the Inflationary Impact of Domestic Price Liberalization and of Interactions between Central Bank Reform and Liberalization

4.1 Effect of domestic price liberalization

The process of decontrol of domestic prices produced sizable temporary non monetary jumps in the rate of inflation of many transition economies as prices of domestic goods were allowed to adjust towards market values. Central Bank reform was often introduced just prior to, or concurrently with, the liberalization of domestic prices. It is likely that in such cases CBI could not contain the temporary impact of price decontrol on the measured rate of inflation. Even if substantial, CBI alone is insufficient to contain the, temporary but powerful, price level adjustments that are essential to the process of liberalization of internal prices. It is therefore possible, in principle, that in spite of the fact that legal CBI does have a negative impact on inflation in the transition countries, this effect is not detected by the regressions in table 3 because of the price shocks created by the process of decontrol of domestic prices.

To examine this possibility we add the index of liberalization of internal prices, I, from de Melo et. al. (1996) to the regressions in table 3. Within each subperiod the value of I is taken as its value in the median year(s) of the subperiod. The results appear in table 4. It is apparent from the table that this variable has a positive and highly significant effect on inflation, and that its addition leads to an increase in the overall explanatory power of all the regressions as characterized by the adjusted R-squared. The coefficients of all four alternative measures of aggregate legal independence are still insignificant. As in table 3 the index of cumulative liberalization is still negative and significant and

Table 4 : Inflation, CBI, liberalization, wars and decontrols of domestic prices [a]

Dependent variable : D

Regressors :

CLI	-0.09	-0.08	-0.09
	(0.00)	(0.00)	(0.00)
I	0.33	0.35	0.34
	(0.01)	(0.01)	(0.01)
WD	0.14	0.15	0.14
	(0.01)	(0.01)	(0.01)
LVAW	-0.10		
	(0.56)		
LVES		-0.14	
		(0.18)	
LVESX			-0.10
			(0.37)
Intercept	0.37	0.36	0.36
	(0.00)	(0.00)	(0.00)
Adj. R- sq	0.39	0.45	0.40
Number of observations	57	51	56

[a]Numbers in parenthesis under the coefficients are levels of significance.

the war dummy is still positive and significant.

The general picture that emerges from table 4 leads to the conclusion that the process of decontrol of domestic prices has a powerful positive impact on measured inflation and that, to this point, there is no evidence to support conventional wisdom regarding the negative relation between inflation and legal CBI.

4.2 Interaction between CB reform and cumulative liberalization

A possible reason for the lack of evidence in favor of a negative relation between inflation and legal independence is that such independence is instrumental in reducing inflation only when other structural features of the economy have become sufficiently and persistently similar to those of developed market economies. A fuller discussion of why this might be the case appears in subsection 4.3 below. To examine this possibility we reestimate the regressions in table 4 with a slope dummy at high values of the cumulative liberalization index.[24] The slope dummy is meant to allow the detection of an interaction between the effects of independence and of liberalization on inflation if such interaction exists. The slope dummy measures the additional effect of legal independence on inflation when the cumulative liberalization index is higher than 2.0.

The most striking result of table 5 is that the slope dummy is negative and highly significant pointing to the existence of a substantial interaction between the effects of cumulative liberalization and of CBI on inflation. The coefficients of CBI at low levels of cumulative liberalization remain insignificant and the coefficient of CLI (which was significant before) becomes insignificant at conventional levels, but its sign remains negative. Finally, the impacts of the war dummy and of (a concave transformation -- denoted I1 of) the index of liberalization of domestic prices on inflation remain positive and significant. In table 5 we have used the concave transformation, I1, of the index of domestic price liberalization**,** instead of the index I itself, to allow for the possibility that the inflationary impact of domestic price decontrols is higher during the earlier than during the later stages

[24]Technically a dummy variable that assumes the value of one when CLI > 2.0 and the value of zero otherwise is defined. It is then used to create an additional variable that is defined as the product of the (appropriate) aggregate legal independence index and the previously defined dummy. The cutoff of 2.0 is chosen so as to leave a similar number of observations on both sides of the cutoff.

Table 5 : Inflation, CBI, liberalization, wars and domestic price decontrols with an interaction effect (cutoff for slope dummy: CLI=2.0) [a]

Dependent variable : D

Regressors :

CLI	-0.03	-0.04	-0.04
	(0.24)	(0.15)	(0.11)
I1	0.17	0.24	0.23
	(0.11)	(0.02)	(0.03)
WD	0.16	0.16	0.15
	(0.00)	(0.00)	(0.01)
LVAW	0.37		
	(0.14)		
LVES		0.04	
		(0.83)	
LVESX			0.08
			(0.60)
Addition to coefficient of CBI in range CLI>2.0	-0.63 (0.01)	-0.27 (0.13)	-0.35 (0.04)
Intercept	0.35	0.34	0.35
	(0.00)	(0.00)	(0.00)
Adj. R- sq	0.48	0.48	0.46
Number of observations	57	51	56

[a]Numbers in parenthesis under the coefficients are levels of significance.

of price decontrols.[25] We chose to present a version of table 5 which utilizes the concave transformation, I1, rather than the original index, I, because the goodness of fit of the regressions in the first case is better. Except for this difference in goodness of fit the two sets of regressions yield similar qualitative results.

4.3 Summary and discussion

The main conclusion from tables 4 and 5 is that the negative relation between legal independence and inflation found in Western Democracies also appears in the FSE but only at sufficiently high levels of sustained liberalization. At low levels of sustained liberalization legal CBI has no impact on inflation while cumulative liberalization **does have** a strong negative impact. By contrast, at high levels of cumulative liberalization CBI has a strong negative impact on inflation and the (still negative) impact of CLI on inflation becomes insignificant.

At first blush this finding may appear surprising. Why should CBI be more effective in containing inflation at higher than at lower levels of cumulative liberalization? A possible reason is that at high levels of sustained liberalization general compliance with the law, including in particular the CB law is higher. As a consequence, for any given level of legal independence, the **effective** level of independence is higher the higher the level of sustained liberalization.

This begs the question of why compliance with the law should be higher in countries with higher levels of sustained liberalization. A possible reason is that the importance of law abidance for the orderly functioning of the economy and of the political system increases with the degree of sustained liberalization. This notion can be illustrated by considering the polar cases of a pure market economy and of a command economy. Law abidance is important for stopping a market economy from deteriorating into chaos by setting and enforcing clear rules of the game in order to limit opportunistic behavior by a large mass of independent agents. By contrast in a command economy, since the freedom of action of most agents is severely limited in the first place, law abidance is not as essential.

---

[25] I1 is a continuous concave function of I which has the same mean value and the same slope at the mean value of I (this slope is one, since I as a function of itself is a 45 degrees line) as I itself. The precise functional form is: I1=1.618 - [1 / (0.618 + I)] and it is restricted to the [0,1] range since the index I is defined only for this range. I=I1=0 means that the process of price decontrols has not started and I=I1=1 means that all domestic prices are fully liberalized.

A further look at table 5 reveals that the coefficient of the aggregate index LVESX -- which assigns positive weights to variables that characterize the severity of limitations on lending to government -- is larger and somewhat more significant than the aggregate index LVES which does not take the impact of such limitations into consideration. This finding supports the view that, once there is sufficient respect for the law, legal limitations on lending to government contribute a marginal negative impact inflation.

4.4 Comparison to Lougani and Sheets

Recently Lougani and Sheets (1997) examined the relation between the logarithm of inflation in 1993 and an index of independence they developed for a sample of twelve FSE. Lougani and Sheets find a negative relation between those two variables[26]. Our sample is wider than theirs in terms of both countries and time periods covered. Since we use a number of CBI indices that differ from theirs it is of some interest to examine the sensitivity of the results they obtain using their sample of countries with our indices and broader time periods. This was done by reestimating the equations in tables 3, 4 and 5 of this paper for 9 out of their 12 countries[27]. Although in all cases the coefficient of aggregate legal independence is negative, it is never significant. When the same experiment is repeated only for the periods after the enactment of the CB laws for the same nine countries, a few of the (negative) coefficients of legal independence become significant but most of them remain insignificant. The interaction between legal independence and cumulative liberalization is negative and significant only in one case -- when the LVES index is used.

5. Inflation and legal central bank independence in an international sample

This section makes a step towards a broader examination of the relation between inflation and legal independence by examining this relationship in a sample that combines the (up to) three periods

[26]The countries in their sample are : Albania, Armenia, Bulgaria, the Czech Republic, Estonia, Hungary, Kazakhstan, Lithuania, Poland, Romania, Russia and Ukraine. They construct an index of legal independence from more basic data collected by Hinton-Braaten (1994) and Lewarne (1995).

[27]This is due to data limitations.

Table 6 : Inflation and legal CBI - an international sample [a]

Dependent variable : D

Regressors :

LVAW	-0.40		-0.41	
	(0.00)		(0.00)	
LVES		-0.19		-0.27
		(0.01)		(0.00)
CLI			-0.06	-0.08
			(0.01)	(0.00)
I			0.53	0.61
			(0.00)	(0.00)
WD			0.15	0.19
			(0.00)	(0.00)
Intercept	0.42	0.35	0.27	0.22
	(0.00)	(0.00)	(0.00)	(0.00)
Adj. R- sq	0.18	0.08	0.55	0.54
Number of observations	79	73	78	72

[a]The international sample includes most of the developed economies during the eighties and our sample of 26 transition economies in the pre and post CB law enactment periods, as well as an "in between laws period" for transition countries that had two CB law reforms.
Numbers in parenthesis under the coefficients are levels of significance.

sample of transition economies used in the previous section with data on inflation and CBI within the developed economies during the 1980's.[28] This data merging yields a sample of up to 79 observations. Two sets of regressions are run. In the first set inflation is related only to the aggregate indices, LVAW and LVES, of legal independence without controlling for other variables. The second set controls for the effects, in transition economies, of factors like price decontrols, wars and the degree of sustained liberalization. Results are summarized in table 6.

It is apparent from the first two columns of the table that, in the combined sample, legal independence (whether measured by the broad index LVAW, or the narrow index LVES) has a negative and highly significant effect on inflation but that the overall goodness of fit is low. Results in the presence of additional factors appear in the last two columns. All variables, including the indices of legal CBI, have the expected signs and are highly significant. It is noteworthy that the inclusion of the controls for the transition countries leads to a substantial increase in the overall goodness of fit without affecting the significance of the negative impact of CBI on inflation. Experimentation with an interaction term between the index of cumulative liberalization and aggregate independence (not shown) does not yield a significant coefficient for the interaction term, but does yield again a negative and significant coefficient for the indices of legal independence.

Interestingly, in all cases the relationship between inflation and legal independence in the overall sample is substantially more significant than in the subsample of developed countries alone. Thus the addition of new central banks in transition economies to the sample of developed economies strengthens conventional wisdom according to which higher legal CBI is associated with lower inflation.

In summary, the results with the international sample yield further support for the view that,

---

[28]The data on the developed economies is taken from Cukierman , Webb and Neyapti (1992). Although data on CBI in developing countries during the eighties is available we do not include those countries in the sample since previous studies show that legal independence was a very poor proxy for actual independence in those countries at that time (Cukierman , Webb and Neyapti (1992) and chapter 20 of Cukierman (1992)). Those studies found no relation between legal independence and inflation in developing countries which led them and others to use behavioral proxies of independence like CB governors' turnover or a measure of the political vulnerability of the CB governor in the face of political change (Cukierman and Webb (1995)). The development of such measures for the transition countries is beyond the scope of this study.

in spite of the fact that legal independence does not always fully translate into actual independence, it is nonetheless associated with significantly lower inflation.

6. Determinants of Legal Independence

Although all FSE enacted CB laws with relatively high levels of independence some countries went in this direction more than others. This section takes a brief look at possible reasons for this cross country variation in the level of independence. Eyeballing of the data reveals that many of the high independence countries have a geographical or cultural closeness to Western Europe and to Germany in particular (Estonia, the Czech Republic and Lithuania), or have a very recent CB law (Georgia, Lithuania, Armenia and Moldova). These observations lead to a number of tentative hypotheses regarding the factors that are conducive to higher CBI. First, it is possible that the cultural impact on countries that are nearer to Western Europe is stronger. To examine this hypothesis we regressed the various indices of legal independence on the distance between the capital city of each of the countries in the sample and Berlin.

Another possibility is that the formal preconditions for joining the EMU might have induced the countries on the fast tracks to join the monetary union to grant more independence. The reason is that one of the preconditions for joining is, according to the Maastricht Treaty, a sufficiently high level of CBI. Poland, Hungary, Slovenia and the Czech Republic are on the first fast track to join the EMU and the Slovak Republic, Rumania, Bulgaria, Lithuania and Latvia are on a second fast track to join it. To test for the possible effect, on the choice of legal independence, of being on either one of the two fast tracks to join the EMU we added two dummy variables to the regression. The first dummy (second) assumes a value of one if the country is on the first (second) fast track to join the EMU and zero otherwise.

To test for the possibility that the level of independence granted is higher the later is the time of reform we also added a regressor that measures the difference between the year of enactment of the CB law and 1990. Finally to examine the possibility that countries with stronger inflationary experiences tend to, subsequently, delegate more authorities to the CB we added the average value of inflation in the years prior to and including the year of enactment of the CB law to the regressions.

The evidence suggests that being on the first (but not on the second) fast track to join EMU

has a significant and positive impact on the level of legal independence chosen. The number of years that elapsed between the year of enactment of the law and 1990 also has a positive and (for some of the aggregate legal indices) significant effect on independence.

Except for the lagged average value of inflation which turned out negative and significant all the remaining variables above turned out insignificant. The negative sign of lagged inflation is obviously inconsistent with the view that the authorities of countries with higher inflation subsequently delegated more authority to their central banks.

7. Concluding Remarks

This paper develops extensive new data on the legal independence of central banks in the post CB reform period in the FSE. The new data is constructed in a manner that makes it comparable to earlier data on CBI in the industrial democracies and in, non FSE developing countries. The data indicates that CB reform in the FSE during the nineties has been quite ambitious. In spite of the large price shocks induced by the transformation from plan to market, or perhaps because of them, reformers in those countries chose to create central banks with levels of legal independence that are substantially higher, on average, than those of developed economies. But since it is likely that the average level of compliance with the law in the FSE is lower than compliance with it in Western democracies the discrepancy in **actual** independence may not be as large as appears to be the case from this comparison.

Taken to the extreme, and in view of the large price shocks caused by liberalization, the preceding observation could lead to the hypothesis that differences in **legal** independence among the different FSE should not matter much for inflation. The evidence in this paper suggests that such a conclusion is too extreme. CBI is indeed unrelated to inflation during the early phases of liberalization. But for sufficiently high and sustained levels of liberalization, and controlling for variables like wars and price liberalization, legal CBI and inflation are significantly and negatively related. These findings are consistent with the view that legal CBI, no matter how high, **cannot** contain the powerful inflationary impacts of price decontrols and of the liberalization of foreign trade and of the exchange rate. But once the process of liberalization has gone far enough legal independence turns out to be effective in slowing inflation down.

Interestingly, the cumulative index of liberalization developed by de Melo et. al. (1996) exerts a significant negative influence on inflation, as is the case in their paper, but only at low levels of cumulative liberalization. At high levels of cumulative liberalization, after a sufficiently sustained experience with the new liberalized institutions has accumulated, CBI becomes relatively more important in keeping inflation down and cumulative liberalization becomes insignificant. One possible explanation for the increase in the effectiveness of CBI at high levels of cumulative liberalization is that law abidance in transition economies rises with the level of cumulative liberalization. As a consequence the discrepancy between the relatively high legal independence of the central banks of economies in transition and their actual independence shrinks -- and legal independence becomes more effective in keeping inflation at bay.

Examination of the relation between inflation and legal independence in an international sample composed of the transition and of the developed economies strengthens the conclusion that legal independence and inflation are negatively related.

Eight out of the twenty six FSE in our sample had two CB reforms. The average level of independence of the first law in those countries was usually lower than the average level of independence in countries with only one CB reform. This was often followed by very high inflation in the countries with two reforms and then by enactment of a second CB law. The average level of independence embodied in the second law is substantially higher than that of the first law in those countries. It is also higher than the average level of independence in the 18 countries which had only one CB reform.

A preliminary examination of the factors that determine the level of legal independence chosen by political authorities suggests that being on the first fast track to join the EMU has a positive effect on legal independence, and that the later the year of CB reform the higher the level of independence embodied in the new charter. A possible reason is that the importance of CBI as a signal of financial respectability, to gain access to international credit markets, rose through the nineties with the further abolition of restrictions on capital flows and further widening of international capital markets. But the existing evidence does not support the view that countries with higher inflation subsequently grant higher independence to the CB.

The fact that the average level of legal independence of the new central banks of economies

in transition is substantially higher than that of developed economies during the eighties at least partially reflects the shift in professional consensus among economists and policymakers in favor of CBI between those two decades. Our feeling is that, had CB reform in the transition economies taken place during the eighties rather than during the nineties, the level of CBI embodied in the new laws would have been significantly lower. This is one concrete illustration of the broader principle that existing professional consensus at the time of reform affects the pattern of reform.

References

Alesina A. (1988), "Macroeconomics and Politics", **NBER Macroeconomics Annual**, 3: 13-52.

Alesina A. (1989), "Politics and Business Cycles in the Industrial Democracies", **Economic Policy**, 8, pp. 57-98.

Alesina A. and L. Summers (1993), "Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence", **Journal of Money, Credit and Banking,** 25, 151-162.

Bade R. and M. Parkin (1988), "Central Bank Laws and Monetary Policy", University of Western Ohio, October, Manuscript.

Barro R. (1979), "On the Determination of the Public Debt", **Journal of Political Economy**, 8, pp. 1095-1117, November-December.

Barro, R. (1984), **Macroeconomics**, John Wiley.

Conway P. (1995), "Currency Proliferation :The Monetary Legacy of the Former Soviet Union", **Essays in International Finance**, No. 197, International Finance Section, Princeton University, June.

Cukierman A. (1992), **Central Bank Strategy, Credibility And Independence-Theory and Evidence.** The MIT Press, Cambridge, MA.

Cukierman A. (1998), "The Economics of Central Banking", in H. Wolf (ed.), **Contemporary Economic Issues: Macroeconomics and Finance (IEA Series)**, The Macmillan Press, Houndmills, Basingstoke, UK.

Cukierman A., S. Webb and B. Neyapti (1992), " Measuring The Independence of Central Banks and Its Effect on Policy Outcomes", **The World Bank Economic Review**, 6, 353-98, September.

Cukierman A. and S.B. Webb (1995), "Political Influence on the Central Bank: International Evidence", **The World Bank Economic Review**, 9, No. 3, September, 397-423.

de Melo M., C. Denizer and A. Gelb (1996), "From Plan to Market: Patterns of Transition", Policy Research Working Papers, No. 1564, World Bank.

European Bank for Reconstruction and Development-Transition Report (1994).

European Bank for Reconstruction and Development-Transition Update (1997).

Eijffinger S. and De Haan (1996), "The Political Economy of Central Bank Independence", Special Papers in International Economics No. 19, **International Finance Section**, Department of Economics, Princeton University, May.

Eijffinger S. and M. van Keulen (1995), " Central Bank Independence in Another Eleven Countries", **Banca Nazionale del Lavoro Quarterly Review**, 192, 39-83.

Eijffinger S. and E. Schaling (1993), "Central Bank Independence in Twelve Industrial Countries", **Banca Nazionale del Lavoro Quarterly Review**, 184, 64-68, March.

Grilli V. D. Masciandro and G. Tabellini (1991), " Political and Monetary Institutions and Public Financial Policies in The Industrial Countries", **Economic Policy**, No. 13, 341-92.

Haan J. de and van't Hag (1995), "Variation in Central Bank Independence Across Countries: Some Provisional Evidence", **Public Choice**, 81.

Haan J. de and Kooi W. J. (1998), "Does Central Bank Independence Really Matter Department of Economics, University of Groningen, February.

Hinton-Braaten K. (1994), "New Central Banks", Manuscript, July.

Hochreiter E. (1994), "Central Banking in Economies in Transition", in T. D. Willet, R. C. K. Burdekin, R. J. Sweeney and C. Whilborg (eds.) **Monetary Stability in Emerging Market Economies**, The Westview Press.

Hochreiter E. and S. Riesinger (1995), "Central Banking in Central and Eastern Europe- Selected Institutional Issues", **ECU-Journal,** 32, 17-22, July.

Hochreiter E., R. Rovelli and G. Winckler (1996), "Central Banks and Seignorage: A Study of Three Economies in Transition", **European Economic Review**, 40, 629-643.

Huterski R., R. Nicholls and Z. Wisniewski (1999), "Monetary Policy and Independence of Polish Central Bank", in N. M. Healey and Z. Wisniewski, **Central Banking in Transition Economies**, Torun Business School, Poland.

Leone A. (1991), "Effectiveness and Implications of Limits on Central Bank Credit to the Government", in **The Evolving Role of Central Banks**, Downes, P. and R. Vaez-Zadeh (eds.), IMF.

Lewarne S. (1995), “The Russian Central Bank and the Conduct of Monetary Policy” in T. D. Willet, R. C. K. Burdekin, R. J. Sweeney and C. Whilborg (eds.) **Monetary Stability in Emerging Market Economies**, The Westview Press, 167-192.

Lougani P. And N. Sheets (1997), “Central Bank Independence, Inflation, and Growth in Transition Economies”, **Journal of Money Credit and Banking**, 29, 381-399, August.

Melliss C. L. and M. Cornelius (1994), "New Currencies in the Former Soviet Union: a Recipe for Hyperinflation or the path to price stability?", Working Paper Series No. 26, Bank of England, September.

Neyapti B. (1997), "Budget Deficits and Inflation: An Analysis in Light of the Roles of Central Bank Independence and Financial Market Development", Unpublished Ph.D thesis, Department of Economics, University of Maryland.

Neyapti B. (2000), “Central Bank Independence and Economic Performance in Eastern Europe ", Discussion Paper Series, No.00-7, Bilkent University.

Radzyner O. and Riesinger S. (1997), “Central Bank Independence in Transition: Legislation and Reality in Central and Eastern Europe”, Manuscript, Austrian National Bank.

Roubini N. and J. Sachs (1989), “Political and Economic Determinants of Budget Deficits in the Industrial Democracies”, **European Economic Review,** 33, 903-33, May.

Stern N. (1996), “The Transition in Eastern Europe and the Former Soviet Union: Some Strategic Lessons from the experience of 25 countries over 6 Years”, Elisha Pazner Memorial Lecture.

Wojtyna A. (1997), "Central Bank Independence and the Constitution", **Emergo - Journal of Transforming Economies and Societies**, 4, Autumn, 49-55.

.

APPENDIX

Table A1: Codings of the components of aggregate indices of legal central bank independence

Country	Year of Enactment of Central Bank Law	CEO				Policy Formulation			Objectives	Limitations on lending							
		Term of office	Who appoints	Dis-missal	Other offices	Who formu-lates	Final authority	Role in budget		Advances	Securitized lending	Terms of lending	Potential borrowers	Type of limit	Maturity of loans	Interest rates	Primary market
Albania	1992	0.75	0.75	0.83	0.50	0.67	0.20	NA	0.60	0.33	0.67	0.33	NA	0.33	1.00	0.75	0.00
Armenia	1993	0.75	0.50	0.00	1.00	1.00	0.20	0.00	0.60	0.00	0.33	0.00	0.00	0.33	0.00	0.25	0.00
	1996	0.75	0.50	0.83	1.00	1.00	1.00	1.00	1.00	1.00	0.67	0.67	0.67	0.33	0.67	1.00	1.00
Azerbaijan	1992	NA	0.50	0.33	0.00	0.33	NA	0.00	0.60	0.00	0.00	0.00	NA	NA	1.00	0.25	0.00
	1996	0.50	0.00	0.17	1.00	0.67	NA	0.00	0.40	0.00	0.00	0.33	0.33	NA	0.00	0.25	0.00
Belarus	1992	0.75	0.50	1.00	1.00	0.67	0.80	1.00	0.80	1.00	0.33	0.67	0.33	0.00	1.00	0.25	1.00
Bulgaria	1991	0.50	0.50	0.83	1.00	0.67	NA	NA	0.60	0.67	0.00	0.33	NA	0.33	1.00	0.25	1.00
Croatia	1992	0.75	0.50	0.33	0.00	1.00	0.20	0.00	0.60	0.67	0.00	0.67	NA	0.33	0.67	0.25	0.00
Czech Republic	1991	0.75	0.50	0.83	1.00	1.00	1.00	NA	0.80	0.67	0.67	0.67	NA	0.33	1.00	0.25	0.00
Estonia	1993	0.50	0.50	0.83	1.00	1.00	1.00	1.00	0.80	1.00	1.00	NA	NA	NA	NA	NA	0.00
Georgia	1995	0.75	0.50	0.83	1.00	1.00	0.40	1.00	0.60	1.00	0.67	0.67	1.00	0.33	1.00	0.75	0.00
Hungary	1991	0.75	0.50	0.83	1.00	0.67	1.00	1.00	0.60	0.67	NA	0.33	1.00	0.33	0.33	0.75	0.00
Kazakstan	1993	0.75	0.50	0.33	0.00	0.67	0.60	0.00	0.60	0.00	0.00	0.33	0.00	NA	0.67	0.75	0.00
	1995	0.75	0.50	0.33	1.00	1.00	1.00	0.00	0.60	0.00	0.00	0.33	0.33	NA	0.00	0.75	1.00
Kyrgyz Republic	1992	0.50	0.50	0.83	1.00	0.67	0.40	1.00	0.60	0.33	0.00	0.67	NA	0.00	1.00	0.25	1.00
Latvia	1992	0.75	0.50	0.33	1.00	1.00	1.00	0.00	0.80	0.00	0.00	0.67	NA	0.33	1.00	0.25	0.00
Lithuania	1991	NA	0.50	1.00	0.00	0.33	0.40	0.00	0.40	0.00	0.33	0.00	0.67	0.00	0.00	0.25	0.00
	1996	0.50	0.50	0.83	1.00	1.00	1.00	1.00	0.80	1.00	1.00	NA	NA	NA	NA	NA	0.00
Macedonia	1995	0.75	0.50	0.83	0.00	1.00	0.40	0.00	0.60	0.00	0.33	0.67	0.33	0.00	0.67	0.75	0.00
Moldova	1991	0.75	0.50	0.83	1.00	1.00	0.80	0.00	0.60	0.00	0.00	0.33	0.00	NA	0.00	0.25	0.00
	1995	0.75	0.50	0.83	1.00	1.00	1.00	1.00	0.80	1.00	0.00	0.33	0.67	NA	1.00	0.75	1.00
Mongolia	1991	0.50	0.50	1.00	0.00	1.00	1.00	0.00	0.80	0.00	0.00	0.67	NA	NA	0.00	0.25	0.00
	1996	0.75	0.50	0.50	1.00	1.00	1.00	0.00	0.60	0.67	0.00	0.67	0.33	0.33	0.67	0.25	0.00
Poland	1991	0.75	0.50	0.83	1.00	0.33	0.60	1.00	0.60	0.00	0.67	0.33	0.33	0.00	0.00	0.25	0.00
	1997	0.75	0.50	0.83	1.00	1.00	1.00	1.00	0.60	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Romania	1991	0.00	0.50	0.33	1.00	0.67	0.40	0.00	0.40	0.33	0.00	0.33	NA	0.00	0.00	0.25	0.00
Russia	1995	0.25	0.50	0.83	1.00	0.67	0.20	1.00	0.60	1.00	0.00	0.00	0.33	NA	0.00	0.75	0.00
Slovak Republic	1992	0.75	0.50	0.67	1.00	1.00	1.00	0.00	0.60	NA	0.67	0.67	0.00	0.33	1.00	NA	0.00
Slovenia	1991	0.75	0.50	1.00	1.00	1.00	0.40	NA	0.80	0.67	0.00	1.00	NA	0.00	0.67	0.25	0.00
Tajikistan	1993	NA	0.50	0.50	0.00	0.67	NA	1.00	0.60	0.00	0.00	0.33	0.67	NA	0.00	0.25	0.00
Turkmenistan	1992	NA	0.50	1.00	0.50	0.33	0.00	0.00	0.60	0.00	0.00	0.00	0.33	NA	0.00	0.25	0.00
Ukraine	1991	NA	0.50	NA	NA	0.67	NA	1.00	0.60	0.00	0.00	NA	NA	NA	NA	NA	NA
Uzbekistan	1992?	0.25	0.50	0.50	1.00	0.67	NA	0.00	0.60	0.00	0.67	0.00	0.33	0.33	1.00	0.75	1.00
Uzbekistan	1995	0.25	0.50	0.83	0.00	1.00	1.00	1.00	0.60	1.00	0.00	0.00	0.00	NA	1.00	0.75	1.00

Notes:

1. A detailed description of the 16 legal variables in the table appears in table 1 (pp. 358-9) of Cukierman, Webb and Neyapti, (1992) or Table 19.1 (pp. 373-6) of Cukierman (1992).
2. Although the 1997 charter of the Bank of Poland does not contain any reference to limitations on lending to government we assigned the maximum value of 1.00 to all the limitations on lending variables for Poland in 1997. The reason is that article 220 - 2 in the chapter on Public Finances (ch. X) of the April, 2, 1997 constitution of the Republic of Poland states that; "The budget shall not provide for covering a budget deficit by way of contracting credit obligations to the State's central bank".

Table A2: Yearly Inflation Rates and Rates of Depreciation in the Real Value of Money (D), 1989-98

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
	Inflation -- period averages:														**D**					
Albania	0	0	36	226	85	23	7.8	12.7	32.1	20.6	0.00	0.00	0.26	0.69	0.46	0.19	0.07	0.11	0.24	0.17
Armenia	0	10.3	100	1346	3500	5273	176.7	18.7	14	6.7	0.00	0.09	0.50	0.93	0.97	0.98	0.64	0.16	0.12	0.06
Azerbaijan	0	7.8	107	912	1129	1664	411.7	19.7	8.4	-0.8	0.00	0.07	0.52	0.90	0.92	0.94	0.80	0.16	0.08	-0.01
Belarus	1.7	4.5	83.5	971	1187	2200	709.3	53	63.9	77	0.02	0.04	0.46	0.91	0.92	0.96	0.88	0.35	0.39	0.44
Bulgaria	6	22	333.5	82	73	96.3	62.1	123	1082	22	0.06	0.18	0.77	0.45	0.42	0.49	0.38	0.55	0.92	0.18
Croatia	2520.5	135.6	123	665.5	1517.5	97.6	2	3.5	3.6	5.7	0.96	0.58	0.55	0.87	0.94	0.49	0.02	0.03	0.03	0.05
Czech Rep.	2.3	10.8	56.6	11.1	20.8	10	9.1	8.8	8.5	10.7	0.02	0.10	0.36	0.10	0.17	0.09	0.08	0.08	0.08	0.10
Estonia	6.1	23	210.5	1076	89.8	48	29	23	11	10.6	0.06	0.19	0.68	0.91	0.47	0.32	0.22	0.19	0.10	0.10
Georgia	0	3.3	79	887	3125	15607	162.7	39.4	7.3	3.7	0.00	0.03	0.44	0.90	0.97	0.99	0.62	0.28	0.07	0.04
Hungary	17	28.9	35	23	22.5	18.8	28.2	23.6	18.3	14.3	0.15	0.22	0.26	0.19	0.18	0.16	0.22	0.19	0.15	0.13
Kazakstan	0	4.2	79	1381	1662	1892	176	39.1	17.4	7.3	0.00	0.04	0.44	0.93	0.94	0.95	0.64	0.28	0.15	0.07
Kyrgyz Rep.	0	3	85	855	772	229	52.5	30.4	25.5	13	0.00	0.03	0.46	0.90	0.89	0.70	0.34	0.23	0.20	0.12
Latvia	4.7	10.5	172	951	108	36	25	17.6	8.4	4.7	0.04	0.10	0.63	0.90	0.52	0.26	0.20	0.15	0.08	0.04
Lithuania	2.1	8.4	224.7	1020.5	410.4	72.1	39.5	24.7	8.9	5.1	0.02	0.08	0.69	0.91	0.80	0.42	0.28	0.20	0.08	0.05
Macedonia	1246	120.5	229.7	1664.4	338.4	126.5	16.4	2.5	1.8	0.6	0.93	0.55	0.70	0.94	0.77	0.56	0.14	0.02	0.02	0.01
Moldova	0	4.2	98	1276.4	788.5	330	30	23.5	11.8	8	0.00	0.04	0.49	0.93	0.89	0.77	0.23	0.19	0.11	0.07
Mongolia	0	0	208.6	321	183	145	56.8	na	na	na	0.00	0.00	0.68	0.76	0.65	0.59	0.36	na	na	na
Poland	251	585.8	70.3	43	35.3	32.2	27.8	19.9	14.9	11.8	0.72	0.85	0.41	0.30	0.26	0.24	0.22	0.17	0.13	0.11
Romania	1.1	5.1	161	210.4	256	136.7	32.3	38.8	154.8	59.2	0.01	0.05	0.62	0.68	0.72	0.58	0.24	0.28	0.61	0.37
Russia	2.2	5.6	93	1526	875	311.4	197.7	47.7	14.7	27.8	0.02	0.05	0.48	0.94	0.90	0.76	0.66	0.32	0.13	0.22
Slovak Rep.	0	10.8	61.2	10.1	23.2	13.4	9.9	5.8	6.1	6.7	0.00	0.10	0.38	0.09	0.19	0.12	0.09	0.05	0.06	0.06
Slovenia	1306	550	117.7	207.3	32.9	21	13.5	9.9	8.4	8	0.93	0.85	0.54	0.67	0.25	0.17	0.12	0.09	0.08	0.07
Tajikistan	0	4	112	1157	2195	350	609	418	87.8	43.1	0.00	0.04	0.53	0.92	0.96	0.78	0.86	0.81	0.47	0.30
Turkmenistan	2.1	4.6	103	492.9	3102	1748	1005	992	83.7	17	0.02	0.04	0.51	0.83	0.97	0.95	0.91	0.91	0.46	0.15
Ukraine	2	4	91	1210	4735	891	377	80	16	11	0.02	0.04	0.48	0.92	0.98	0.90	0.79	0.44	0.14	0.10
Uzbekistan	0.7	3.1	82.2	645	534	1568	305	54	72	34	0.01	0.03	0.45	0.87	0.84	0.94	0.75	0.35	0.42	0.25

SOURCES: 1. EBRD, Transition Report Update 1999.
2. de Melo et al. (1996).

D is the rate of depreciation in the real value of money. It is calculated from the relation D=F/(1+F) where F is the yearly rate of inflation.
The inflation data from 1992 and on is from the 1999 EBRD Transition Report Update (the figures for 1998 are estimates as of July 1999).
The data for 1989 and 1990 are from de Melo et al. Except for Armenia, Belarus and FYR Macedonia, whose data are from de Melo et al., the data for 1991 are from the EBRD (1999).
Except for Armenia, Belarus and FYR Macedonia, whose data are from de Melo et al., the data for 1991 are from the 1999 EBRD Transition Report Update.
Data for Mongolia for all years are from de Melo et al.

Table A3: Cumulative Liberalization Index, CLI (*)

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Albania	0	0	0.24	0.9	1.6	2.3	3.04	3.78	4.56
Armenia	0.04	0.08	0.21	0.6	1.02	1.44	1.93	2.65	3.37
Azerbaijan	0.04	0.08	0.12	0.37	0.68	1.03	1.47	2.02	2.64
Belarus	0.04	0.08	0.18	0.38	0.71	1.07	1.55	2.03	2.54
Bulgaria	0.13	0.32	0.94	1.6	2.26	2.9	3.48	4.13	4.92
Croatia	0.41	1.03	1.65	2.37	3.16	3.98	4.83	5.68	6.53
Czech Republic	0	0.16	0.95	1.84	2.74	3.64	4.57	5.5	6.43
Estonia	0.07	0.27	0.59	1.23	2.04	2.93	3.86	4.79	5.72
Georgia	0.04	0.08	0.3	0.62	0.97	1.36	1.85	2.54	3.26
Hungary	0.34	0.91	1.65	2.43	3.25	4.11	5.01	5.91	6.84
Kazakstan	0.04	0.08	0.22	0.57	0.92	1.31	1.92	2.64	3.39
Kyrgyz Republic	0.04	0.08	0.12	0.45	1.05	1.81	2.63	3.49	4.35
Latvia	0.04	0.17	0.46	0.97	1.64	2.45	3.26	4.11	5
Lithuania	0.04	0.17	0.5	1.05	1.83	2.72	3.61	4.5	5.39
Macedonia	0.41	1.03	1.68	2.36	3.14	3.92	4.7	5.52	6.34
Moldova	0.04	0.08	0.18	0.56	1.07	1.62	2.3	3.05	3.8
Mongolia	0	0	0.44	0.99	1.6	2.27	2.94	3.61	4.44
Poland	0.24	0.92	1.64	2.46	3.28	4.14	5.03	5.92	6.81
Romania	0	0.22	0.58	1.03	1.61	2.29	3	3.72	4.47
Russia	0.04	0.08	0.18	0.67	1.26	1.92	2.69	3.49	4.32
Slovak Republic	0	0.16	0.95	1.81	2.64	3.47	4.33	5.19	6.05
Slovenia	0.41	1.03	1.74	2.52	3.34	4.16	5.01	5.88	6.77
Tajikistan	0.04	0.08	0.19	0.39	0.65	0.95	1.34	1.76	2.21
Turkmenistan	0.04	0.08	0.12	0.25	0.41	0.63	0.85	1.17	1.53
Ukraine	0.04	0.08	0.18	0.41	0.54	0.8	1.31	1.9	2.55
Uzbekistan	0.04	0.08	0.12	0.38	0.68	1.11	1.69	2.26	2.83

(*) CLI is composed of the cumulative degrees of liberalization in internal and external markets and private sector entry, with weights of 0.3, 0.3 and 0.4, respectively.
Sources: Till 1995: de Melo et al.(1996); 1996-97: update provided by Cevdet Denizer, World Bank, in July 1999.

Table A4: Panel Data for 3 Subperiods

	PERIOD	D	LVAW	LVES	LVESX	CLI	WD	I	I1
Albania	1	0.24	0.00	0.00	0.00	0.12	0.00	0.10	0.20
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.21	0.51	0.47	0.49	3.41	0.00	0.90	0.96
Armenia	1	0.50	0.00	0.00	0.00	0.21	1.00	0.20	0.40
	2	0.59	0.30	0.60	0.34	2.02	1.00	0.70	0.86
	3	0.09	0.85	1.00	0.90	3.37	0.00	0.80	0.91
Azerbaijan	1	0.48	0.00	0.00	0.00	0.12	1.00	0.00	0.00
	2	0.64	0.22	NA	0.42	1.25	1.00	0.70	0.86
	3	0.03	0.25	NA	0.32	2.64	0.00	0.80	0.91
Belarus	1	0.60	0.00	0.00	0.00	0.38	0.00	0.20	0.40
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.39	0.49	0.47	0.38	2.54	0.00	0.80	0.91
Bulgaria	1	0.20	0.00	0.00	0.00	0.32	0.00	0.00	0.00
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.48	0.55	NA	0.65	3.48	0.00	0.60	0.80
Croatia	1	0.74	0.15	0.16	0.13	1.34	1.00	0.70	0.86
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.26	0.44	0.60	0.49	4.41	1.00	0.90	0.96
Czech Republic	1	0.26	0.00	0.00	0.00	0.16	0.00	0.00	0.00
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.10	0.73	0.96	0.73	4.57	0.00	0.90	0.96
Estonia	1	0.46	0.00	0.00	0.00	0.59	0.00	0.50	0.72
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.31	0.78	0.96	0.58	4.79	0.00	0.90	0.96
Georgia	1	0.56	0.00	0.00	0.00	0.62	1.00	0.50	0.72
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.13	0.73	0.68	0.62	3.26	0.00	0.80	0.91
Hungary	1	0.21	0.24	0.21	0.39	0.91	0.00	0.80	0.91
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.17	0.67	0.79	0.61	5.01	0.00	0.90	0.96
Kazakstan	1	0.47	0.00	0.00	0.00	0.22	0.00	0.10	0.23
	2	0.79	0.32	0.63	0.56	1.60	0.00	0.65	0.82
	3	0.17	0.44	0.92	0.79	3.39	0.00	0.80	0.91
Kyrgyz Republic	1	0.45	0.00	0.00	0.00	0.12	0.00	0.00	0.00
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.32	0.52	0.55	0.55	3.49	0.00	0.80	0.91
Latvia	1	0.42	0.00	0.00	0.00	0.32	0.00	0.40	0.63
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.21	0.49	0.96	0.73	3.69	0.00	0.90	0.96
Lithuania	1	0.26	0.00	0.00	0.00	0.34	0.00	0.40	0.63
	2	0.52	0.28	0.37	0.25	3.17	0.00	0.90	0.96
	3	0.07	0.78	0.96	0.58	5.39	0.00	0.90	0.96
Macedonia	1	0.65	0.15	0.16	0.13	2.36	0.00	0.80	0.91
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.02	0.41	0.68	0.55	6.34	0.00	0.90	0.96
Moldova	1	0.47	0.00	0.00	0.00	0.18	1.00	0.10	0.23
	2	0.50	0.38	0.84	0.54	3.05	1.00	0.80	0.91
	3	0.12	0.73	0.96	0.94	3.80	0.00	0.80	0.91
Mongolia	1	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	PERIOD	D	LVAW	LVES	LVESX	CLI	WD	I	I1
	2	NA	0.43	0.96	0.61	2.27	0.00	0.70	0.86
	3	na	0.55	0.92	0.68	4.44	0.00	0.80	0.91
Poland	1	0.66	0.10	0.27	0.19	0.92	0.00	0.70	0.86
	2	0.22	0.46	0.49	0.32	4.59	0.00	0.90	0.96
	3	0.11	0.89	0.92	0.75	NA	0.00	NA	NA
Romania	1	0.23	0.23	0.76	0.76	0.22	0.00	0.50	0.72
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.50	0.34	0.51	0.32	3.00	0.00	0.80	0.91
Russia	1	0.54	0.00	0.00	0.00	0.67	0.00	0.60	0.80
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.22	0.49	0.47	0.38	4.32	0.00	0.80	0.91
Slovak Republic	1	0.14	0.00	0.00	0.00	0.56	0.00	0.45	0.48
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.10	0.62	0.92	0.73	4.76	0.00	0.90	0.96
Slovenia	1	0.77	0.15	0.16	0.13	1.03	1.00	0.70	0.86
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.21	0.63	0.72	0.52	5.01	0.00	0.90	0.96
Tajikistan	1	0.58	0.00	0.00	0.00	0.39	1.00	0.40	0.23
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.53	0.36	NA	0.29	2.21	1.00	0.70	0.80
Turkmenistan	1	0.47	0.00	0.00	0.00	0.12	0.00	0.00	0.00
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.67	0.26	0.25	0.19	1.17	0.00	0.50	0.72
Ukraine	1	0.49	0.00	0.00	0.00	0.18	0.00	0.10	0.23
	2	NA	NA	NA	NA	NA	NA	NA	NA
	3	0.47	0.42	NA	NA	1.90	0.00	0.70	0.86
Uzbekistan	1	0.52	0.00	0.00	0.00	0.25	0.00	0.00	0.00
	2	0.75	0.41	NA	0.71	1.69	0.00	0.70	0.86
	3	0.34	0.56	0.92	0.92	2.83	0.00	0.60	0.80

Notes:

a. Period 1 starts in 1989. For non former Soviet Union countries it ends in the year of enactment of the first central bank law. For former Soviet Union countries the last year of period 1 is the latest of the year of enactment of the first central bank law and of the. year of replacement of the Ruble by a domestic currency.
Period 2 is the period after the enactment of the first central bank law including the year of enactment of the second central bank law, if there is such a law.
Period 3 covers all the years following the enactment of the last central bank law, up to and including 1998.

b. D is the average rate of depreciation in the real value of money within each subperiod.

c. CLI is the value of the cumulative liberalization index in the middle of each subperiod.
If the number of years in a subperiod is odd, CLI is the value at the median year in that subperiod. If the number of years in a subperiod is even, CLI is the average of the values in the two middle years.
Since the data for 1998 is unavailable, CLI for the third period of countries whose CB enactment year was 1996 (Armenia, Azarbaijan,Lithuania and Mongolia) is the value of CLI in 1997.

d. WD is a war dummy which assumes a value of one in periods (1, 2 or 3) in which the country was at war for more than half of the period, and zero otherwise.

e. I is the value of the de Melo et. al. (1996) index of liberalization of internal prices in the median year(s) of each subperiod.

f. I1 is a concave transformation of I that has the same mean value and the same slope as I at the mean value of I. The precise form of the transformation appears in footnote 25.